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PATENT & TRADEMARK OFFICE

TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.
31305

In Re Application Of: CAVE, STEVEN et al.

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/066,277	02/01/2002	LAROSE, COLIN M.	23589	2623	4418

Invention: AUTOMATED IMAGING SYSTEM AND METHOD FOR CONCRETE QUALITY ANALYSIS

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on

The fee for filing this Appeal Brief is: **$500.00**

☐ A check in the amount of the fee is enclosed.

☐ The Director has already been authorized to charge fees in this application to a Deposit Account.

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Signature

Dated: **December 30, 2005**

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as ~~first class~~ express mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on

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Meghan Abbott Collins

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P30LARGE/REV06

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:	
CAVE, Steven et al.	
Serial No.: 10/066,277	Docket No.: 31305
Filed: February 1, 2002	Group Art Unit No.: 2623
Title:	Examiner: LAROSE, Colin M.
AUTOMATED IMAGING SYSTEM AND METHOD FOR CONCRETE QUALITY ANALYSIS	

APPEAL BRIEF

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application of:

CAVE, Steven et al.

Serial No.: 10/066,277

Filed: February 1, 2002

Title:

AUTOMATED IMAGING SYSTEM AND METHOD FOR CONCRETE QUALITY ANALYSIS

Docket No.: 31305

Group Art Unit No.: 2623

Examiner: LAROSE, Colin M.

Assistant Commissioner of Patents
Washington, D.C. 20231

APPELLANT'S BRIEF ON APPEAL

In response to the Final Office Action dated June 30, 2005, and the Notice of Appeal filed September 30, 2005, Appellant's Brief on Appeal in accordance with 37 C.F.R. § 41.37 is hereby submitted. The Examiner's rejections of claims 1–42 as last amended are herein appealed, and allowance of said claims is respectfully requested.

The Director is hereby authorized to charge the requisite fee of $500.00 as required by 37 C.F.R. § 41.20 and a fee of $120.00 for a one-month extension of time under 37 C.F.R. § 1.17 against Deposit Account No. 19-0522. Any additional fee which is due in connection with this amendment should be applied against Deposit Account No. 19-0522.

Respectfully submitted,

By________________________________

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ATTORNEYS FOR APPELLANT

Following are the requisite statements under 37 C.F.R. § 41.37:

I. Real Party in Interest

Steven P. Cave, Nelson G. Cook, Chris W. Baumgart, and Kim D. Linder are the inventors of the claimed invention. Steven P. Cave, Nelson G. Cook, Chris W. Baumgart, and Kim D. LInder have assigned all of their rights, title, and interest in the invention, application, and any Letters Patent issuing therefrom to Honeywell Federal Manufacturing & Technologies, LLC, a corporation duly organized under the laws of the State of Delaware, and having its principal place of business at 2000 E. 95th Street, Kansas City, MO, 64131. Therefore, Honeywell Federal Manufacturing & Technologies, LLC is the real party in interest.

II. Related Appeals and Interferences

No related appeals or interferences are known to the Appellant which may directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

III. Status of Claims

This application was filed on February 1, 2002, with 42 claims, of which claims 1, 14, 23, and 34 were independent. A first Office Action was mailed November 26, 2004, in which claims 1–42 were rejected. In particular, claims 1–4, 6–8, 23–26, and 28 were rejected under 35 U.S.C. § 102(b) as being anticipated by Esrig, U.S. Patent No. 4,755,874; claims 5 and 7 were rejected under 35 U.S.C. § 103(a) as being unpatentable

over Esrig in view of Jaber, U.S. Patent No. 5,262,967; claims 17 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber, Wallack, U.S. Patent No. 6,748,110, and Mitsuyama, U.S. Patent No. 5,768,412; claims 9–11, 14–16, 18–20, 29–31, 34–36, and 38–40 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack and Mitsuyama; claims 12, 21, 32, and 41 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack, Mitsuyama, and Oosawa, U.S. Patent No. 6,151,408; and claims 13, 22, 33, and 42 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack, Mitsuyama, and Cho, Feature Extraction using Fuzzy Relations for Objects of Various Shapes, IEEE 272 (1996).

In response, Appellant filed an amendment on February 28, 2005 amending claims 1, 14, 23, and 34 and arguing in favor of the amended claims.

In response to Appellant's amendment of February 28, 2005, the Examiner mailed a second, final, Office Action on June 30, 2005 ("OA"), again rejecting claims 1–42 on the same grounds as those set forth in the Office Action dated November 26, 2004.

In response, Appellant filed a Notice of Appeal on September 30, 2005.

Claims 1–42 are pending and the rejections of claims 1–42 are appealed.

IV. Status of Amendments

All amendments submitted by the Appellant have been entered.

V. Summary of Claimed Subject Matter

The invention of independent claim 1 is directed to a system operable to substantially automatically perform an evaluation of a material according to an established standard. The system includes a microscope (reference numeral 24) for magnifying the sample (reference numeral 12), and a light source operable to illuminate the prepared sample at a grazing angle to enhance a contrast between surface features of the sample. (Application, page 8, lines 4–10, page 9, line 29–page 10, line 2). A stage (reference numeral 26) is associated with the microscope and is operable to move and position the sample under the microscope for viewing (*Id.*, page 8, lines 11–16), and an image capturing mechanism (reference numeral 28), such as a CCD camera, is operable to capture an image of the sample through the microscope (*Id.*, page 8, lines 17–23).

The system further includes a computing device (reference numeral 30) operable to control various components of the system and perform automated analyses of the sample. (Application, page 8, lines 24–26). The computer device is operable to control magnification by the microscope, control illumination by the light source, receive images from the image capturing mechanism, control movement of the stage, and store and execute a computer program operable to substantially automatically conduct an analysis of the image. (*Id.*, page 8, line 26–page 9, line 7). In conducting the analysis of the image, the computing device identifies surface features of the sample and determines characteristics of the sample therefrom. (*Id.*, page 9, line 29–page 10, line 13).

The invention of independent claim 14 is similar to the invention of claim 1, except that the computing device of claim 14 is operable to conduct an analysis of the image that

includes various segmentation and recognition techniques to extract and identify voids and other surface objects. (Application, page 10, lines 21–23). More particularly, the computing device uses a color segmentation and recognition technique operable to facilitate identification and classification of an object in the image, and to differentiate the object from other objects in the image (*id.*, page 10, line 25–page 11, line 5); a shape feature segmentation and analysis technique operable to extract the object from the image and to characterize a shape of the object (*id.*, page 10, line 25–30; page 11, lines 6–9); and a intensity profile segmentation and recognition technique operable to identify a unique characteristic of a profile of the object (*id.*, page 10, line 25–30; page 11, lines 10–12).

The invention of independent claim 23 is directed to a method of substantially automatically performing an evaluation of a sample of a material according to an established standard. According to the method, the sample is magnified and illuminated, wherein the illumination is provided at a grazing angle so as to enhance a contrast between surface features of the sample, and an image of the magnified and illuminated sample is captured. (*Id.*, page 9, line 29–page 10, line 10).

Magnification and illumination of the sample, and capturing the image, are controlled automatically using a computing device. (Application, page 8, lines 24–30). The computing device also substantially automatically performs an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom in accordance with the established standard. (*Id.*, page 10, lines 3–13).

The invention of independent claim 34 is similar to the invention of claim 23, except that the method of the invention of claim 34 further includes the step of preparing the sample in a manner consistent with the established standard in order to facilitate analyzing

the sample. (Application, page 9, lines 16–21). Furthermore, according to the method of claim 34, the image analysis includes facilitating identification and classification of an object in the image and differentiating the object from other objects in the image using a color segmentation and recognition technique (application, page 10, line 13–page 11, line 5); extracting the object from the image and characterizing a shape of the object using a shape feature segmentation and analysis technique (*id.*, page 10, lines 13–30; page 11, lines 6–9); and analyzing individual scans across the image to identify a unique characteristic of a profile of the object using a intensity profile segmentation and recognition technique (*id.*, page 10, lines 13–30; page 11, lines 10–12).

VI. Grounds of Rejection to be Reviewed on Appeal

1. Claims 1–4, 6–8, 23–26, and 28 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Esrig, U.S. Patent No. 4,755,874.
2. Claims 5 and 7 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber.
3. Claims 17 and 37 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Jaber, Wallack, and Mitsuyama.
4. Claims 9–11, 14–16, 18–20, 29–31, 34–36, and 38–40 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Esrig in view of Wallack and Mitsuyama.

VII. Argument

A. Summary of Esrig Reference

Esrig discloses a system for detecting faults in an integrated circuit chip, referred to as "the device under test" or the "DUT". (Esrig, abstract). More particularly, the system disclosed in Esrig locates a damaged dielectric of an integrated circuit by detecting "extremely faint light" generated by a current flowing through the damaged dielectric. (*Id.*, col. 1, lines 9–11). Such dielectric damage is internal to the integrated circuit, as evidenced by the fact that prior art techniques for detecting such damage involve "stripping layers off of the DUT". (*Id.*, col. 1, line 66–col. 2, line 2).

The method disclosed in Esrig involves first illuminating the DUT with an external light source and capturing a "reflected light top view image" of the DUT. (Esrig, col. 1, lines 23–26; *see* Fig. 1). The illumination is then removed and a "background image" of the DUT is captured that includes only undesired, random background light. (*Id.*, lines 27–34). Power is then applied to the DUT to energize the integrated circuit contained therein, and an "emitted light image" of the DUT is captured that includes both the undesired background light as well as emitted light spots corresponding to integrated circuit defects. (*Id.*, lines 39–44). The background image is subtracted from the emitted light image, resulting in a "difference image" that includes only defect emission bright spots. (*Id.*, lines 43–45). Because the difference image is generated in the absence of ambient light, the reflected light top view image is superimposed over the difference image to assist a user in determining the physical location of each defect emission bright spot on the DUT. (*Id.*, lines 58–62).

It is important to note that while the application invention determines characteristics of a material sample by processing a ***reflected*** light image to identify ***surface features*** of the sample, the system disclosed in Esrig detects defects in an integrated circuit using an image of ***internally generated*** light to identify ***internal damage***. Esrig employs a reflected light image of the DUT merely to enable a user to approximate a physical location of an internal fault.

B. Summary of Jaber Reference

Jaber discloses a system (reference numeral 2) for testing and inspecting concrete. Referring to figure 1, the system includes a computer (reference numeral 10), a computer-driven stage (reference numeral 6), a microscope (reference numeral 4), and a monitor (reference numeral 24). Jaber also discloses various methods of using the system to automatically determine the air-void content of hardened concrete. (Jaber, col. 2, lines 31–37). A user collects data relating to air-voids with the system by viewing images of the concrete sample captured by the microscope and indicating when an air-void is present in the image. (*Id.*, col. 3, lines 65–69, col. 4, lines 17, 28, 31–32, 55–59, 69, and col. 5, lines 10–15, 40–43). Importantly, the system disclosed in Jaber does not automatically analyze the image to identify surface features of a sample of concrete, but rather ***requires a user to identify*** the features by viewing the images.

C. Summary of Arguments

Appellant respectfully submits that the Examiner's rejections should not be sustained because:

1. the Examiner has failed to identify a prior art reference that teaches each and every limitation of claims 1 and 23;
2. the Examiner has failed to cite properly analogous art in rejecting claims 5, 17, 27, and 37;
3. the Examiner has failed to identify a proper suggestion or motivation to combine Esrig with Jaber;
4. the Examiner has failed to identify a proper suggestion or motivation to combine Esrig with Wallack and Mitsuyama; and
5. the Examiner has failed to identify a prior art reference or combination of references that teach or suggest all the limitations of claims 5, 9, 14, 17, 29, 34, and 37.

D. The Examiner has failed, with regard to the rejection of independent claims 1 and 23 under 35 U.S.C. § 102(a) over Esrig, to cite a single prior art reference that discloses each and every limitation set forth in claims 1 and 23.

In the office action dated June 30, 2005, the Examiner argued that Esrig discloses each element of the invention of claims 1 and 23. (OA, pages 2–3). Appellant respectfully disagrees. Esrig fails to teach, either expressly or implicitly, at least "a computing device operable to . . . store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom . . ." as recited in claim 1, and a similar limitation recited in claim 23.

Appellant notes that a "claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628 (Fed. Cir. 1987); MPEP § 2131. Furthermore, the "identical invention must be shown in as complete detail as is contained in the . . . claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226 (Fed. Cir. 1989); MPEP § 2131.

The computing device recited in claim 1 is operable to, among other things, substantially automatically conduct an analysis of an image to identify ***surface features*** of a sample and ***determine characteristics of the sample therefrom***. The system disclosed in Esrig, in contrast, detects defects in an integrated circuit using an image of ***internally generated*** light to identify ***internal damage*** of an integrated circuit.

The Examiner argues that these elements are taught by Esrig in FIGs. 4 and 5, and asserts that these figures

> show that the features of the sample, such as noise and defects, are identified. These features provide an indication of the characteristics of the sample under inspection—i.e. whether the sample contains many defects. In addition, Esrig discloses difference processing that identifies areas free of defects and removes those areas from suspicion (column 6, lines 3–10).

(OA, pages 3—4). Unfortunately, this argument fails to address the actual language of claims 1 and 23. As explained above, the computing device recited in claim 1 identifies ***surface features*** of the sample, and determines characteristics of the sample from the surface features. The dictionary defines a surface as "the exterior or outside of an object or body: the outermost or uppermost boundary . . ." (WEBSTER'S THIRD NEW INTERNATIONAL DICTIONARY 2300 (2002)). Use of the word "surface" in the specification is consonant with

the dictionary definition, because exemplary surface features recited in the application include voids and edges of voids. (*See* application, page 9, line 29–page 10, line 10).

The system disclosed by Esrig clearly does not automatically identify surface features of a sample. Rather, the system of Esrig identifies ***internal defects*** in integrated circuits. (Esrig, col. 2, lines 39–41). While Esrig does not expressly refer to the defects as internal defects, such is inherent from Esrig's teachings and from general knowledge of the art. Esrig, for example, explains that certain prior art techniques of locating integrated circuit defects involved "stripping layers off of the [device under test]." (*Id.*, col. 1, line 66–col. 2, line 2). If such defects were not internal to the integrated circuit, there would be no need to strip layers off the device. Furthermore, Esrig teaches that "emission microscopy according to the present invention locates silicon oxide dielectric and passivation ***layer*** defects of the following types . . ." (Esrig, ¶ 16, emphasis added). Because integrated circuit layers are internal to the device, the defects identified by the system of Esrig are internal defects and not surface features.

With regard to FIGs. 4 and 5, those figures illustrate differences in emitted light (used to identify a defect in the integrated circuit) and noise light (discarded). FIG. 4 illustrates "a sub-area of IC 10 . . . plotted in the XY plane with sub-area noise and defect bright spot intensities plotted on a gray level scale along the Z axis." (Esrig, col. 5, lines 36–39). FIG. 5 compares a threshold used by prior art filters with a threshold used by the invention disclosed in Esrig. (*Id.*, col 5, lines 40–43). Thus, FIGs. 4 and 5 merely provide graphical illustrations of differences in emitted light and noise light and filter thresholds used to separate the two. As explained above, however, neither the emitted light nor the

noise light is related to surface features of a sample. In fact, the emitted light is related to ***internal defects*** of the integrated circuit, as explained above. Therefore, FIGs. 4 and 5 are unrelated to analyses for identifying surface features of a sample and cannot be relied upon to teach or suggest any element of claim 1 or claim 23.

Because Esrig fails to disclose, either expressly or implicitly, at least "a computing device operable to . . . store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom . . ." as recited in claim 1 and a similar elements of claim 23, the rejection of claims 1 and 23 under 35 U.S.C. § 102(a) over Esrig are improper and cannot be sustained.

E. The Examiner has failed, with regard to the rejection of independent claims 5, 17, 27, and 37 under 35 U.S.C. § 103(a) over Esrig in view of Jaber, to establish the requisite *prima facie* case of obviousness by citing properly analogous art.

The Examiner's rejections of claims 5, 7, 17, and 27 depend at least on the combination of Esrig with Jaber. Appellant respectfully submits that Esrig is not properly analogous art, and therefore, the rejections under 35 U.S.C. § 103(a) of claims 5, 7, 17, and 27 are improper.

The primary test for determining whether a prior art reference is properly analogous with respect to an invention is as follows:

> (1) whether the art is from the same field of endeavor, regardless of the problem addressed; and

(2) if the reference is not within the same field of the inventor's endeavor, whether the reference still is reasonably pertinent to the particular problem with which the inventor is involved.

In re Clay, 23 USPQ2d 1058, 1060 (Fed. Cir. 1992). Furthermore, an invention cannot be considered to be within the field of endeavor of a prior art reference merely because both relate to the same industry. *Id.* However, "[a] reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to the inventor's attention in considering his problem." *Id.* at 1061. Patent examination is necessarily conducted by hindsight, with complete knowledge and benefit of the patent owner's invention as a guide. *In re Oetiker*, 977 F.2d 1443, 1447 (Fed. Cir. 1992). For this reason, it is necessary to consider the "reality of the circumstances" in deciding in which fields a person of ordinary skill in the art would reasonably be expected to look for the solution to the problem facing the inventor. *Id.* at 1447. Ultimately, a rejection based on non-analogous art cannot be sustained. *In re Clay*, 23 USPQ2d at 1061.

The test set forth in *In re Clay* was also tellingly applied, for example, in *In re Oetiker*, which is cited by and discussed in MPEP § 2141.01(a) in the context of determining analogousness in the mechanical arts. *In re Oetiker*, 977 F.2d at 1446. In *In re Oeitker*, an improvement was claimed to a stepless, earless metal clamp, with the improvement being a preassembly hook which serves to both maintain a preassembly condition of the clamp and to disengage automatically when the clamp is tightened. *Id.* at 1445. All claims were rejected over the combination of U.S. Patent No. 4,492,004 to

Oetiker, which disclosed the unimproved clamp, and U.S. Patent No. 3,426,400 to Lauro, which disclosed a plastic hook and eye fastener for use in garments. *Id.* at 1445.

Oetiker argued during prosecution that Lauro's garment hook was non-analogous art in that a person of ordinary skill seeking to solve the problem facing Oetiker would not look to the garment art for the solution. *Id.* at 1445. The Examiner argued that because garments commonly use hooks for securement, a person faced with the problem of unreliable maintenance of the pre-assembly configuration of an assembly line metal hose clamp would look to the garment industry art. *Id.* at 1445. On Appeal, the Board held that Lauro was analogous art because both Lauro's and the Oetiker's inventions relate to "a hooking problem." *Id.* at 1445.

The Federal Circuit, however, disagreed, stating that it had not been shown that a person of ordinary skill seeking to solve the problem facing Oetiker would reasonably be expected or motivated to look to fasteners for garments. Furthermore:

> The combination of elements from non-analogous sources, in a manner that reconstructs the Patent Owner's invention only with the benefit of hindsight, is insufficient to present a *prima facie* case of obviousness. There must be some reason, suggestion, or motivation found in the prior art whereby a person of ordinary skill in the field of the invention would make the combination. That knowledge cannot come from the Patent Owner's invention itself. *Id.* at 1446.

Applying the criteria of *In re Clay* and the teachings of *In re Oetiker*, Esrig is neither in the same field of endeavor as the application invention nor is Esrig reasonably pertinent to the problem solved by the application invention.

Esrig is not in the same field of endeavor as the application invention because Esrig seeks to solve a different problem from a different industry in a different way than the

application invention. The problem Esrig seeks to solve relates to detecting defects in integrated circuits, while the application invention relates to automatically evaluating a concrete sample to determine characteristics of the sample. Esrig solves the problem of detecting defects in an integrated circuit by energizing the circuit, capturing an image of light emitted by defects in the circuit, and filtering the image to remove light spots that do not originate from circuit defects. The application invention solves the problem of automatically evaluating a concrete sample to determine characteristics of the sample by capturing a surface image of a prepared sample of concrete and analyzing the surface image to identify surface features. Thus, Esrig is in an entirely different field of endeavor than that of the application invention.

Furthermore, Esrig is not reasonably pertinent to the problem solved by the application invention. An inventor facing the problem of automated analysis of surface features of concrete certainly would not look to an integrated circuit testing device for guidance, wherein the testing device senses light emissions originating from internal defects of the circuit. Esrig has nothing to offer the field of concrete analysis, therefore the subject matter of Esrig would not have logically "commended itself to the inventor's attention in considering his problem."

F. The Examiner has failed, with regard to the rejection of claims 5, 17, 27, and 37 under 35 U.S.C. § 103(a) over Esrig in view of Jaber, to establish the requisite *prima facie* case of obviousness by identifying a proper motivation or suggestion to combine Jaber with Esrig.

Obviousness, it will be appreciated, can be a problematic basis for rejection because the Examiner, in deciding that a feature is obvious, has the benefit of the

Applicant's disclosure as a blueprint and guide. In contrast, one with ordinary skill in the art would have no such guide, in which light even an exceedingly complex solution may seem easy or obvious. Furthermore, once an obviousness rejection has been made, the Applicant is in the exceedingly difficult position of having to prove a negative proposition (i.e., non-obviousness) in order to overcome the rejection. For these reasons, MPEP § 2142 places upon the Examiner the initial burden of establishing a *prima facie* case, which requires, among other things, that there be identified some motivation or suggestion in the prior art or in the knowledge of one with ordinary skill to modify the reference or to combine reference teachings. If the Examiner fails to establish the requisite *prima facie* case, the rejection is improper and will be overturned. *See In re Rijckaert,* 28 USPQ2d 1955, 1956 (Fed. Cir. 1993). Only if the Examiner's burden is met does the burden shift to the Applicant to provide evidence to refute the rejection.

More specifically, three criteria must be satisfied in order to establish a *prima facie* case of obviousness: (1) there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine their teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference (or combination of references) must teach or suggest all the claim limitations. *See* MPEP §706.02(j), citing *In re Vaeck*, 20 USPQ2d 1438 (Fed. Cir. 1991). Furthermore, "[t]he mere fact that the prior art may be modified in the manner suggested by the Examiner does not make the modification obvious unless the prior art suggested the desirability of the modification." *In re Fritch,* 23 USPQ2d 1780, 1783-84 (Fed. Cir. 1992) (reversing an obviousness rejection where there was no suggestion to modify a prior art mower strip to make it entirely flexible as required

by applicant's claims toward a flexible landscape edging strip); *see also In re Gordon*, 221 USPQ2d 1125, 1127 (Fed. Cir. 1984). Additionally, "if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification." MPEP § 2143.01. Further yet, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984).

In meeting this initial burden, the Examiner "cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." *In re Fine*, 5 USPQ2d 1596, 1600 (Fed. Cir. 1988). Both the teaching or suggestion to make the claimed combination and the reasonable expectation of success must be found in the prior art and not based on the applicant's disclosure. *See In re Vaeck*, 20 USPQ2d 1438, 1442 (Fed. Cir. 1991). Thus, "[m]easuring a claimed invention against the standard established by section 103 requires the oft-difficult but critical step of casting the mind back to the time of invention, to consider the thinking of one of ordinary skill in the art, guided only by the prior art references and the then-accepted wisdom in the field." *See e.g., W. L. Gore & Assoc., Inc. v. Garlock, Inc.*, 220 USPQ 303, 313 (Fed. Cir. 1983).

The Examiner argued in the Office Action that it would have been "obvious to one of ordinary skill in the art at the time of the invention to modify Esrig by Jaber to inspect concrete as claimed, since Jaber discloses that it is conventional to inspect concrete for

quality control purposes." (OA, page 6). Appellant respectfully disagrees. As noted above, if a proposed modification would render a prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900 (Fed. Cir. 1984). Modifying the system of Esrig to analyze surface features of concrete would render it unsatisfactory for its intended purpose of analyzing light emissions originating from defective integrated circuits.

More particularly, Esrig discloses an *emission microscopy* system, while Jaber discloses a *concrete testing and inspection* system. The system of Esrig energizes an integrated circuit device, which causes defective portions of the device to emit light. The emitted light is then matched with a physical location on the integrated circuit. There is no indication in either Esrig or Jaber that emission microscopy may be used to analyze concrete, or that surface features may be used to detect defective elements of an integrated circuit. Therefore, modifying Esrig to analyze surface features of a sample would render it unsatisfactory for its intended purpose of analyzing internal defects. Furthermore, Jaber only discloses ***manually*** reviewing a magnified concrete sample and does not contemplate ***automated*** image analysis. Thus, there is no suggestion or motivation in either Esrig or Jaber, to combine the references as proposed by the Examiner.

G. The Examiner has failed, with regard to the rejection of claims 5 and 27 under 35 U.S.C. § 103(a) over Esrig in view of Jaber, to establish the requisite *prima facie* case of obviousness by citing a reference or combination of references that teach or suggest all the limitations of claims 5 and 27.

Even if Jaber is indiscriminately combined with Esrig in an attempt to reject claims 5 and 27, that combination fails to teach or suggest each limitation of claims 5 and 27.

Claim 5 depends from claim 1, and claim 27 depends from claim 23. As explained above in subsection "E," Esrig fails to disclose a computing device operable to "store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom" as recited in claim 1 and a similar limitation of claim 23. Furthermore, Jaber teaches a system for inspecting concrete wherein a user ***manually views*** images of the concrete generated by the system to identify characteristics of the concrete. (Jaber, col. 3, lines 65–69, col. 4, lines 17, 28, 31–32, 55–59, col. 5, lines 11–15, 40–43). Therefore, both Esrig and Jaber fail to disclose a computing device operable to "store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom".

Furthermore, neither Esrig nor Jaber provides a suggestion or motivation to modify a reference to include these limitations. First, Esrig discloses an emission microscopy system that is operable to detect light emissions originating from within an integrated circuit, as explained above, and therefore there is no need to modify Esrig to be operable to conduct an analysis of an image to identify surface features of the sample and

determine characteristics of the sample therefrom. In fact, modifying Esrig to analyze surface features of a sample would render it unsatisfactory for its intended purpose because integrated circuit defects are not evident from *surface features*, but rather from *emitted light* that originates from internal layers of the circuit, as explained above.

Jaber also fails to suggest a computing device operable to conduct an analysis of an image to identify surface features of the sample and determine characteristics of the sample therefrom because Jaber discloses an entirely different method of analyzing a material sample, namely physical inspection by a user. (Jaber, col. 3, lines 65–69, col. 4, lines 17, 28, 31–32, 55–59, col. 5, lines 11–15, 40–43). It should be noted that automated image analysis to identify surface features is not an arbitrary design choice or a trivial undertaking. Rather, it would entail a complete redesign of the system of Jaber. Jaber clearly does not contemplate or suggest replacing its manual inspection system with an automated analysis system.

Claim 5 further recites that the material sample to be evaluated is concrete, and that the analysis includes "identifying and measuring a number of voids in the sample," and claim 27 recites a similar limitation. Thus, the inventions of claims 5 and 27 involve substantially automatically performing an analysis of a surface image of a sample of material to identify surface features of the sample, including identifying and measuring a number of voids, and determining characteristics of the sample therefrom. Neither Esrig nor Jaber, considered singly or in combination, teach or suggest this limitation. The system of Jaber does not automatically analyze anything, but requires a *user* to perform an analysis. The emission microscopy system of Esrig detects light *emitted* from *internal* defects in an integrated circuit, and is completely unrelated to surface features of concrete.

For at least these reasons, Esrig and Jaber fail to teach or suggest the limitations of a computing device operable to "store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom," and that the material sample to be evaluated is concrete and that the analysis includes "identifying and measuring a number of voids in the sample" as recited in claim 5 and similar limitations of claim 27. Therefore, the Examiner has failed to establish a *prima facie* case of obviousness and the rejection of claims 5 and 27 over Esrig in view of Jaber cannot be sustained.

H. The Examiner has failed, with regard to the rejection of claims 9, 14, 29 and 34 under 35 U.S.C. § 103(a) over Esrig in view of Wallack and Mitsuyama, to establish the requisite *prima facie* case of obviousness by identifying a proper motivation or suggestion to combine Esrig with Wallack and Mitsuyama.

The Examiner relies on Wallack and Mitsuyama to teach the color segmentation and recognition technique as well as the shape feature segmentation and analysis technique recited in claims 9, 14, 29, and 34. However, the Examiner has failed to identify a proper motivation or suggestion to make the proposed combination.

In support of the proposed combination, the Examiner asserted that "Wallack shows that such techniques are advantageous for identifying and characterizing objects in samples under inspection and provides more data with which to inspect the samples." (OA, page 8). Unfortunately, the Examiner failed to disclose a particular teaching of Wallack in support of the asserted motivation. Even assuming Wallack discloses the

desirability of shape feature or color segmentation and recognition analysis techniques, it does so in the context of an automated manufacturing inspection process (see FIG. 1 of Wallack), which is entirely unrelated to the emission microscopy system disclosed in Esrig. The system of Esrig detects brightness and size of emitted light spots, and makes no mention of detecting or using a "shape" or a "color" of a surface feature, much less extracting an object from the image and characterizing a shape of the object, as recited in claim 1. Therefore, neither Wallack nor Esrig provide a suggestion or motivation to make the proposed combination. Because there is no suggestion or motivation to combine Esrig with Wallack and Mitsuyama, the Examiner's rejections based on this combination of references is improper and must be overruled.

I. The Examiner has failed, with regard to the rejection of claims 14 and 34 under 35 U.S.C. § 103(a) over Esrig in view of Wallack and Mitsuyama, to establish the requisite *prima facie* case of obviousness by citing a reference or combination of references that teach or suggest all the limitations of claims 14 and 34.

Claim 14 recites "a computing device operable to . . . store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom . . ." as recited in claim 1, and claim 34 recites a similar limitation. As explained above in section "E," Esrig does not teach or suggest this element of claims 14 and 34.

Thus, because the prior art references, considered singly or in combination, fail to teach or suggest at least "a computing device operable to . . . store and execute a computer program operable to substantially automatically conduct an analysis of the image

to identify surface features of the sample and determine characteristics of the sample therefrom . . ." as recited in claim 14 and a similar limitation of claim 34, the rejections of claims 14 and 34 under 35 U.S.C. § 103(a) over Esrig in view of Wallack and Mitsuyama are improper and cannot be sustained.

J. The Examiner has failed, with regard to the rejection of claims 17 and 37 under 35 U.S.C. § 103(a) over Esrig in view of Jabber, Wallack and Mitsuyama, to establish the requisite *prima facie* case of obviousness by citing a reference or combination of references that teach or suggest all the limitations of claims 17 and 37.

Claim 17 depends from claim 14 and claim 37 depends from claim 34. As explained above in section "E," Esrig fails to disclose a computing device operable to "store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom" as recited in claim (and as recited in a similar element of claim 34). Furthermore, Jaber teaches a system for inspecting concrete wherein a user manually views images of the concrete generated by the system to identify characteristics of the concrete. (Jaber, col. 3, lines 65–69, col. 4, lines 17, 28, 31–32, 55–59, col. 5, lines 11–15, 40–43). Therefore, both Esrig and Jaber fail to disclose a computing device operable to "store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom".

Furthermore, the references considered singly or in combination do not provide a suggestion or motivation to modify either reference to include these limitations. First, Esrig

discloses an emission microscopy system that is operable to detect light emissions originating from within an integrated circuit, as explained above, and therefore there is no need to modify Esrig to be operable to conduct an analysis of an image to identify surface features of the sample and determine characteristics of the sample therefrom. In fact, modifying Esrig to analyze surface features of a sample would render it unsatisfactory for its intended purposes because integrated circuit defects are not evident from *surface features*, but rather from *emitted light* that originates from internal layers of the circuit, as explained above. Jaber fails to suggest a computing device operable to conduct an analysis of an image to identify surface features of the sample and determine characteristics of the sample therefrom because Jaber discloses an entirely different method of analyzing a material sample, namely physical inspection by a user. (Jaber, col. 3, lines 65–69, col. 4, lines 17, 28, 31–32, 55–59, col. 5, lines 11–15, 40–43). It should be noted that image analysis to identify surface features is not an arbitrary design choice or a trivial engineering undertaking. Rather, it would entail a complete redesign of the system of Jaber. Jaber clearly does not contemplate or suggest replacing its inspection system with an automated system.

Claims 17 and 37 further recite that the material sample to be evaluated is concrete, and that the analysis includes "identifying and measuring a number of voids in the sample." Thus, the invention of claims 17 and 37 substantially automatically perform an analysis of a surface image of a sample of concrete to identify surface features of the sample, including identifying and measuring a number of voids, and determining characteristics of the sample therefrom. Neither Esrig nor Jaber, considered singly or in combination, teaches or suggest this limitation. The system of Jaber does not automatically analyze

anything, but requires a *user* to perform an analysis. The emission microscopy system of Esrig detects light *emitted* from *internal* defects in an integrated circuit, and is completely unrelated to surface features of concrete.

K. Conclusion

The Examiner has failed, with regard to the rejection of independent claims 1 and 23 under 35 U.S.C. § 102(a) over Esrig, to cite a single prior art reference that discloses the limitation of *a computing device operable to store and execute a computer program operable to substantially automatically conduct an analysis of the sample therefrom.*

The Examiner has further failed, with regard to the rejection of claims 5, 9, 14, 17, 27, 29, 34, and 37 under 35 U.S.C. § 103(a), to establish the requisite *prima facie* case of obvious by citing properly analogous art because Esrig is nonanalogous. The Examiner has further failed, with regard to the rejection of claims 5, 9, 14, 17, 27, 29, 34, and 37 under 35 U.S.C. § 103(a), to establish the requisite *prima facie* case of obvious by identifying a proper motivation or suggestion to combine Esrig with Jaber, Wallack, or Mitsuyama. The Examiner has further failed, with regard to the rejection of claims 5 and 27 under 35 U.S.C. § 103(a) over Esrig in view of Jaber, to establish the requisite *prima facie* case of obviousness by citing a reference or combination of references that teach or suggest the limitations of *a computing device operable to store and execute a computer program operable to substantially automatically conduct an analysis of the sample*

therefrom and *wherein the material is concrete . . . and the analysis includes identifying and measuring a number of voids in the sample.*

The Examiner has further failed, with regard to the rejection of claims 14 and 34 under 35 U.S.C. § 103(a) over Esrig in view of Wallack and Mitsuyama, to establish the requisite *prima facie* case of obviousness by citing a reference or combination of references that teach or suggest the limitations of *a computing device operable to store and execute a computer program operable to substantially automatically conduct an analysis of the sample therefrom.* The Examiner has further failed, with regard to the rejection of claims 17 and 37 under 35 U.S.C. § 103(a) over Esrig in view of Jabber, Wallack and Mitsuyama, to establish the requisite *prima facie* case of obviousness by citing a reference or combination of references that teach or suggest the limitations of *a computing device operable to store and execute a computer program operable to substantially automatically conduct an analysis of the sample therefrom* and *wherein the material is concrete . . . and the analysis includes identifying and measuring a number of voids in the sample.*

Accordingly, reversal of the Examiner's rejections is proper, and such favorable action is solicited.

Respectfully submitted,

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VIII. Claims Appendix

1. A system operable to substantially automatically perform an evaluation of a sample of a material according to an established standard, wherein the system comprises:

a microscope operable to magnify the sample;

a light source operable to illuminate the sample, wherein the illumination is provided at a grazing angle so as to enhance a contrast between surface features of the sample;

a stage associated with the microscope and operable to move and position the sample under the microscope for viewing;

an image capturing mechanism operable to capture an image of the sample through the microscope; and

a computing device operable to control magnification by the microscope, control illumination by the light source, receive images from the image capturing device, control movement of the stage, and store and execute a computer program operable to substantially automatically conduct an analysis of the image to identify surface features of the sample and determine characteristics of the sample therefrom, and to generate a report setting forth a result of the analysis.

2. The system as set forth in claim 1, wherein the analysis includes identification and measurement of one or more components of the sample.

3. The system as set forth in claim 1, wherein the analysis includes identification and measurement of one or more physical features of the sample.

4. The system as set forth in claim 1, wherein the sample is prepared prior to being magnified by the microscope, wherein such preparation facilitates the analysis.

5. The system as set forth in claim 1, wherein the material is concrete and the sample is prepared in accordance with the established standard prior to being magnified by the microscope, wherein such preparation includes polishing a face of the sample, and the analysis includes identifying and measuring a number of voids in the sample.

6. The system as set forth in claim 1, wherein the image capturing mechanism is a CCD camera.

7. The system as set forth in claim 1, wherein the stage is a high-precision two-dimensional stage controlled by the computing device to avoid overlapping fields-of-view.

8. The system as set forth in claim 1, wherein the computer program provides a graphical user interface operable to facilitate a user setting up and initiating the analysis, and to facilitate the user causing the report to be generated.

9. The system as set forth in claim 1, wherein the computer program performs a number of different image analysis techniques on the image, including -

a color segmentation and recognition technique operable to facilitate identification and classification of an object in the image, and to differentiate the object from other objects in the image;

a shape feature segmentation and analysis technique operable to extract the object from the image and to characterize a shape of the object; and

a intensity profile segmentation and recognition technique operable to identify a unique characteristic of a profile of the object.

10. The system as set forth in claim 9, wherein the color segmentation and recognition technique is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

11. The system as set forth in claim 9, wherein the color segmentation and recognition technique uses a nearest neighbor technique to identify and classify the object.

12. The system as set forth in claim 9, wherein the color segmentation and recognition technique uses a neural network and an associated rulebase to identify and classify the object.

13. The system as set forth in claim 9, wherein the object is a void and the shape feature segmentation and analysis technique is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are enhanced by the grazing angle of the illumination.

14. A system operable to substantially automatically perform an evaluation of a prepared sample of a material according to an established standard, wherein the system comprises:

a microscope operable to magnify the prepared sample;

a light source operable to illuminate the prepared sample, wherein the illumination is provided at a grazing angle so as to enhance surface a contrast between surface features of the sample;

a high-precision two-dimensional stage associated with the microscope and operable to move and position the prepared sample under the microscope for viewing;

a CCD camera operable to capture an image of the prepared sample through the microscope; and

a computing device operable to control magnification by the microscope, control illumination by the light source, receive images from the image capturing device, control movement of the high-precision of the two-dimensional stage so as to avoid overlapping fields-of-view, and store and execute a computer program operable to substantially automatically conduct an analysis of the

image to identify surface features of the sample and determine characteristics of the sample therefrom, wherein the analysis includes -

a color segmentation and recognition technique operable to facilitate identification and classification of an object in the image, and to differentiate the object from other objects in the image,

a shape feature segmentation and analysis technique operable to extract the object from the image and to characterize a shape of the object, and

a intensity profile segmentation and recognition technique operable to identify a unique characteristic of a profile of the object.

15. The system as set forth in claim 14, wherein the analysis includes identification and measurement of one or more components of the sample.

16. The system as set forth in claim 14, wherein the analysis includes identification and measurement of one or more physical features of the sample.

17. The system as set forth in claim 14, wherein the material is concrete and the sample is prepared in accordance with the established standard prior to being magnified by the microscope, wherein such preparation includes polishing a face of the sample, and the analysis includes identifying and measuring a number of voids in the sample.

18. The system as set forth in claim 14, wherein the computer program provides a graphical user interface operable to facilitate a user setting up and initiating the analysis, and to facilitate the user causing the report to be generated.

19. The system as set forth in claim 14, wherein the color segmentation and recognition technique is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

20. The system as set forth in claim 14, wherein the color segmentation and recognition technique uses a nearest neighbor technique to identify and classify the object.

21. The system as set forth in claim 14, wherein the color segmentation and recognition technique uses a neural network and an associated rulebase to identify and classify the object.

22. The system as set forth in claim 14, wherein the object is a void and the shape feature segmentation and analysis technique is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are enhanced by the grazing angle of the illumination.

23. A method of substantially automatically performing an evaluation of a sample of a material according to an established standard, wherein the method comprises the steps of:

(a) magnifying and illuminating the sample, wherein the illumination is provided at a grazing angle so as to enhance surface a contrast between surface features of the sample;

(b) capturing an image of the magnified and illuminated sample;

(c) controlling magnification and illumination of the sample and capturing of the image substantially automatically, using a computing device; and

(d) performing an analysis of the image substantially automatically, using a computing device, to identify surface features of the sample and determine characteristics of the sample therefrom to allow for the evaluation of the sample in accordance with the established standard.

24. The method as set forth in claim 23, wherein the analysis in step (d) includes identification of one or more components of the sample.

25. The method as set forth in claim 23, wherein the analysis in step (d) includes identification of one or more physical features of the sample.

26. The method as set forth in claim 23, further including step (e) preparing the sample prior to performing step (a) so as to facilitate the analysis.

27. The method as set forth in claim 26, wherein the material is concrete and the preparation in step (e) includes polishing a face of the sample, and the analysis in step (d) includes identifying and measuring any voids in the sample.

28. The method as set forth in claim 23, wherein step (c) includes moving the sample in a precise computer-controlled manner so as to avoid overlapping fields-of-view.

29. The method as set forth in claim 23, wherein the analysis in step (d) includes

(d_1) facilitating identification and classification of an object in the image and differentiating the object from other objects in the image using a color segmentation and recognition technique;

(d_2) extracting the object from the image and characterizing a shape of the object using a shape feature segmentation and analysis technique; and

(d_3) analyzing individual scans across the image to identify a unique characteristic of a profile of the object using a intensity profile segmentation and recognition technique.

30. The method as set forth in claim 29, wherein the color segmentation and recognition technique in step (d_1) is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

31. The system as set forth in claim 29, wherein the color segmentation and recognition technique in step (d_1) uses a nearest neighbor technique to identify and classify the object.

32. The system as set forth in claim 29, wherein the color segmentation and recognition technique in step (d_1) uses a neural network and an associated rulebase to identify and classify the object.

33. The system as set forth in claim 29, wherein the object is a void and the shape feature segmentation and analysis technique in step (d_2) is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are a result of the grazing angle of the illumination.

34. A method of substantially automatically performing an evaluation of a sample of a material according to an established standard, wherein the method comprises the steps of:

(a) preparing the sample in a manner consistent with the established standard in order to facilitate analyzing the sample;

(b) magnifying and illuminating the sample, wherein the illumination is provided at a grazing angle so as to enhance surface a contrast between surface features of the sample;

(c) capturing an image of the magnified and illuminated sample;

(d) controlling magnification and illumination of the sample and capturing of the image substantially automatically, using a computing device; and

(e) performing an analysis of the image substantially automatically, using a computing device, to allow for the evaluation of the sample to identify surface features of the sample and determine characteristics of the sample therefrom in accordance with the established standard, wherein the analysis includes -

(e_1) facilitating identification and classification of an object in the image and differentiating the object from other objects in the image using a color segmentation and recognition technique,

(e_2) extracting the object from the image and characterizing a shape of the object using a shape feature segmentation and analysis technique, and

(e_3) analyzing individual scans across the image to identify a unique characteristic of a profile of the object using a intensity profile segmentation and recognition technique.

35. The method as set forth in claim 34, wherein the analysis in step (e) includes identification of one or more components of the sample.

36. The method as set forth in claim 34, wherein the analysis in step (e) includes identification of one or more physical features of the sample.

37. The method as set forth in claim 34, wherein the material is concrete and the preparation in step (a) includes polishing a face of the sample, and the analysis in step (e) includes identifying and measuring any voids in the sample.

38. The method as set forth in claim 34, wherein step (d) includes moving the sample in a precise computer-controlled manner so as to avoid overlapping fields-of-view.

39. The method as set forth in claim 34, wherein the color segmentation and recognition technique in step (e_1) is based on one or more color planes selected from the group consisting of: three color RGB, hue, and saturation.

40. The system as set forth in claim 34, wherein the color segmentation and recognition technique in step (e_1) uses a nearest neighbor technique to identify and classify the object.

41. The system as set forth in claim 34, wherein the color segmentation and recognition technique in step (e_1) uses a neural network and an associated rulebase to identify and classify the object.

42. The system as set forth in claim 34, wherein the object is a void and the shape feature segmentation and analysis technique in step (e_2) is operable to extract the void from the image and to characterize the shape of the void by correlating a bright area of the void with a dark region of the void using a fuzzy logic correlator, wherein the bright area and the dark region are a result of the grazing angle of the illumination.

IX. Evidence appendix

None.

X. Related proceedings appendix

None.